

[REDACTED]

From:
Sent:
To:

Cc:

Subject: RE: Urgent Request for additional Butt Weld Info

Importance: High

We also should be looking at socket welded joints that are not remotely isolable from sea. (I recognize that we looked at non-isoable socket welded joints already [i.e. 18 SSW joints] but the question on remotely isolable is a new action item from this morning's brief.)

[REDACTED]

-----Original Message-----

From: [REDACTED]
Sent: Monday, November 19, 2007 14:57
To: [REDACTED]

Subject: Urgent Request for additional Butt Weld Info

Based on the review with Senior NAVSEA personnel today regarding the Weld Wire Issue, one action item that SOSNN was assigned is listed below:

- Obtain from NGNN a list of NGNN accomplished Hull Integrity butt weld joints that do not receive 360 degree RT. On this list annotate any of the follow attributes that are applicable (1) joints that are open to sea below 200 feet, and (2) joints that are remotely isolable from sea.

This is supporting info needed to demonstrate that butt joints are not in question.

If you have any questions please call me or [REDACTED] or [REDACTED] Also, please let us know when you can get this to us!

Thanks,
[REDACTED]

[REDACTED]

Subject: FW: Update:SSN776 DSS-SOC Cert
Location: B79 O30 Conf Rm (2nd Fl South end)

Start: Mon 12/3/2007 9:00 AM
End: Mon 12/3/2007 10:00 AM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Please plan to attend in my office.

[REDACTED]

From:
Sent:
To:

[REDACTED]

Cc:
Subject: Update:SSN776 DSS-SOC Cert
When: Monday, December 03, 2007 9:00 AM-10:00 AM (GMT-05:00) Eastern Time (US & Canada).
Where: B79 O30 Conf Rm (2nd Fl South end)

When: Monday, December 03, 2007 9:00 AM-10:00 AM (GMT-05:00) Eastern Time (US & Canada).
Where: B79 O30 Conf Rm (2nd Fl South end)

~~*~*~*~*~*~*~*

Update the approach to come through the SSN776 DSS-SOC recommendation regarding NN filler metal control issues.
Please forward as needed.

For those calling in, here is the phone number and pass code:

[REDACTED]

r/
[REDACTED]

[REDACTED]

From:
Sent:
To:
Cc:
Subject:

[REDACTED]

FW: Telecon on 12-7-07 @ 10:00 AM to discuss NGNN Fatigue Test Plan

Attachments: ole0.bmp; ole1.bmp



ole0.bmp (21 KB) ole1.bmp (34 KB)

Please correct my e-mail address to delete "" in my last name. I have not been getting your e-mails.

[REDACTED]

-----Original Message-----

From: [REDACTED]
Sent: Friday, December 07, 2007 10:07
To: [REDACTED]
Subject: FW: Telecon on 12-7-07 @ 10:00 AM to discuss NGNN Fatigue Test Plan

[REDACTED]

[REDACTED]

12/07/2007 07:03 AM To

[REDACTED]

[REDACTED]

[REDACTED] Subject Telecon on 12-7-07 @ 10:00 AM to discuss NGNN Fatigue Test Plan

The proposed plan for a set of fatigue tests, intended as additional risk mitigation mockups in parallel for CRES joints with copper contamination (considered as part of the

life of ship evaluation) is provided below for your consideration/review. A telecon will be held at 10:00 AM for interested parties to discuss the proposed tests. Phone number and pass code for the telecon are as follows.

Phone Number: [REDACTED]

References

- a. Naval Shipboard Piping Structural Design Manual (NSPSDM), dated October 1994
- b. ASME Section III, Division 1 Appendices - Mandatory Appendix II, Article II-1000 "Experimental Stress Analysis"
- c. NGNN testing "Fatigue Testing of CRES socket weld joint with CuNi Root, CuNi socket weld joint with CRES Root and [REDACTED] socket weld joint with CuNi root", dated 11/18/07
- d. NGNN letter "Weld Filler Metal Control, Recommendation for Continued Construction and testing for SSN777, and Continued Operation for SSN774, SSN775 and SSN776, for NAVSEA Approval" dated 11/26/07, DA # N021499.

Purpose:

- * Determine the impacts (fatigue performance and mode of failure) of varying amounts of copper poisoning on CRES socket weld joints.
- * Cyclically displace socket welded piping test assemblies subjected to a sustained internal hydrostatic pressure. Determine the number of cycles to leakage and the failure mode (i.e. leak before break or catastrophic failure of the weld). Load the joints to the maximum allowable stress range which the joint could be capable of seeing in service if designed in accordance with the requirements of reference (a). Test shall:
 - * Determine if the weld joint will fail in a ductile manner (i.e. leak before break in lieu of catastrophic separation)
 - * From a fatigue standpoint, get an assessment on the capabilities of an incorrectly welded socket joint to withstand stress ranges allowed per the design requirements of the reference (a and (b)).

A simplified sketch of the test set up is provided below:

Approach

The test shall consist of the following for each % contamination of copper: The overall approach for the fatigue testing will follow the same process accomplished in reference (c) which was accomplished to support reference (d).

- * Test specimens are 2 NPS x .344 nominal wall CRES 304 piping. Electrodes: CRES - MIL-308, CuNi - MIL-RN67
- * Determine an elastic spring constant for each of the test specimens in the test set-up by obtaining a force versus displacement curve. This is used to determine the required deflection to obtain the necessary maximum allowable stress range per reference (a).
- * For each socket weld joint, it requires approximately 4 layers. The filler metal combinations will be modified to apply varying amounts of CuNi in the joint and the test plan will follow the following logic flowchart:

[REDACTED]

From: [REDACTED]
Sent: Friday, December 07, 2007 6:37 PM
To: [REDACTED]

Subject: Fw: Preliminary SSN779 Lab Report

Attachments: Prelim Lab data for Critique UE-01366.pdf



Prelim Lab data for
Critique U...

As promised.

Sent from my BlackBerry Wireless Handheld

----- Original Message -----

From: [REDACTED]
To: [REDACTED]

[REDACTED]

Sent: Fri Dec 07 18:22:52 2007
Subject: Preliminary SSN779 Lab Report

[REDACTED] As promised, following up on our discussion this evening, the preliminary SSN779 Lab Report (Joint AHP-21010) is provided below.

[REDACTED]

<<Prelim Lab data for Critique UE-01366.pdf>>

Otoole, Raymond D CIV NAVSEA HQ, SEA 05

From: [REDACTED]
Sent: Friday, December 07, 2007 6:37 PM
To: [REDACTED]
Subject: Re: Preliminary SSN779 Lab Report

Thanks already forwarded file.

Sent from my BlackBerry Wireless Handheld

----- Original Message -----

From: [REDACTED]
To: [REDACTED]

[REDACTED]
Sent: Fri Dec 07 18:22:52 2007
Subject: Preliminary SSN779 Lab Report

[REDACTED] - As promised, following up on our discussion this evening, the preliminary SSN779 Lab Report (Joint AHP-21010) is provided below.

[REDACTED]

<<Prelim Lab data for Critique UE-01366.pdf>>



DEPARTMENT OF THE NAVY
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR, USN
4101 WASHINGTON AVENUE, BUILDING 2
NEWPORT NEWS, VIRGINIA 23607-2787

IN REPLY REFER TO:

9074
Ser SSN 774CL-
260/015604
26 Nov 07

From: Supervisor of Shipbuilding, Conversion and Repair, USN, Newport News
To: Program Executive Office, Submarines (PMS 450)
614 Sicard Street, SE, Stop 7026
Washington Navy Yard, DC 20376-7026
Attention: [REDACTED] PMS 450

Subj: VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100 – WELD FILLER METAL CONTROL, RECOMMENDATION FOR CONTINUED CONSTRUCTION AND TESTING FOR SSN777, AND CONTINUED OPERATION FOR SSN774, SSN775 AND SSN776, FOR NAVSEA APPROVAL

Encl: (1) NNS&DDCo ltr Ser N021499 of 26 Nov 2007
(2) SUPSHIPNN Quality Assurance Department Assessment – VCS Weld Wire Issue

Ref: (a) NAVSEA 9074-AR-GIB-010/278 – Requirements for Fabrication Welding and Inspection, and Casting Inspection and Repair for Machinery, Piping and Pressure Vessels
(b) ASME Section III, Division I appendices – Mandatory Appendix II, Article II-1000 "Experimental Stress Analysis", 2007 Edition

1. Forwarded for action.

BACKGROUND:

2. During the initial air pressure testing of the Emergency Main Ballast Tank Blow (EMBT) System on SSN 778 in late August of 2007, a leak was found in the toe of socket weld joint EMBT-20072 (adjacent to EMBT-25). This socket weld joint is ½" nominal pipe size (NPS) fabricated of corrosion resistant steel (CRES) material. Analysis of the removed joint identified high concentrations of copper material in the vicinity of the leak. The leak was caused by a crack which extended approximately 0.4" around the circumference of the pipe at the fillet weld toe. An unplanned event critique (UE-01236) was conducted by Newport News Shipbuilding and Dry Dock Company (NNS&DDCo) and although several investigative paths were taken, no specific root cause was uncovered for the presence of copper, although it is clear that the welder applied some small amount of a copper bearing filler material to a small section of the joint near the toe of the weld. The event was considered to have been isolated based on the reviews performed.

3. As part of the Naval Sea Systems Command (NAVSEA) 08 functional audit of NNS&DDCo conducted in mid-October of 2007, a Category "A" item was written in the area of welding. The finding identified concerns regarding filler metal control practices at the welder level, concerns regarding welder discipline and concerns related to improper management response to production weld process failures.

4. During initial air testing of Hydraulic Torpedo Tube Valve Station piping on SSN 778 on 26 October 2007, a leak was found in a non-accountable (class P-2) weld joint. This socket weld joint is ½" NPS fabricated of CRES material. An analysis of the removed joint identified high concentrations of copper material in the root bead of the weld. The leak was caused by a crack approximately 0.25" in length. UE-01299 was conducted by NNS&DDCo and again, although several investigative actions were taken, including analysis of other work done by the suspect welder, no definitive root cause was discovered.

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5. The close proximity of the failure of two NNS&DDCo fabricated weld joints coupled with the NAVSEA audit finding resulted in increased scrutiny of this issue on both the government's and contractor's parts. This scrutiny and understanding of the weaknesses in the overall process drove NNS&DDCo to take several immediate corrective actions including:

a. Trades personnel were directed to refer all welding filler metal issues to welding engineering and shipyard management for resolution. Welding engineering will establish the required corrective action and each event will be critiqued. Previously, welders were permitted to self correct problems noted during fabrication.

b. Welders and management personnel were briefed on the issues and the importance of adhering to shipyard procedures and increased surveillance of filler metal use was established.

c. A stand down was accomplished to raise visibility and ensure all affected personnel understood the company's expectations for complying with requirements and for raising weld issues to the appropriate personnel.

d. Welders will be restricted to carrying one type of metal per weld process beginning 26 November 2007.

6. NNS&DDCo committed to review the potential that improper filler metals exist in VIRGINIA Class submarines and to address the associated risks, the consequence of failure and the overall health of the processes utilized by NNS&DDCo. Enclosure (1) provides the results of this review and requests government approval to proceed with short term key events and operations on selected VIRGINIA Class submarines.

DISCUSSION – NNS&DDCo Evaluation:

7. Enclosure (1) documents the welding quality and process controls, welding process audit results, shipboard filler material validation, special welding record reviews, laboratory testing and engineering analysis that was performed by NNS&DDCo in support of the commitment noted in paragraph 6 herein. Utilizing the combined results of that review, NNS&DDCo makes the argument that welds in structure, nuclear piping, non-nuclear castings, and non-nuclear machinery and pressure vessels are not impacted by these recent failures and that any issue resides within the non-nuclear piping weld arena. Enclosure (1) then provides rationale to eliminate category P-2 piping welds and all butt welds from the area of potential concern which narrows the final analysis to non-nuclear piping system socket welds (SW).

8. With the area of concern limited to non-nuclear socket welds, NNS&DDCo proceeds to analyze the risks associated with the use of incorrect filler metal within a given socket weld joint. Enclosure (1) provides an overview of the various base metal/filler metal combinations that were considered (six base metals with six filler metals for a total of 36 combinations) and the results of test welds made both by bead on plate (which was determined not to adequately represent actual joint configurations) and by actual socket weld or butt weld mock-ups. These tests, documented in enclosure (3) to enclosure (1), break the improper combinations (30 each) into four mismatched categories.

a. Compatible but not matching – 12 each. These are combinations which can be welded without producing defects but where the mismatch can lead to strength or corrosion concerns. An example would be nickel copper piping welded with copper nickel (CUNI) filler metal.

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b. Not matching but weldable – 1 each. This describes testing on a CRES joint with carbon steel filler metal.

c. Not compatible with cracks in the weld metal – 16 each. This series of tests/extrapolations identifies that in nearly every case, the filler metal will crack during application but the cracking does not extend into the base metal.

d. Not compatible with cracks in the base metal – 1 each. This test identifies CRES material welded with CUNI filler metal. This is identified as the worst combination as far as cracking is concerned and indicates that cracking of the base metal will occur.

9. The testing noted above forms the basis for additional testing performed by NNS&DDCo to determine the potential for welding the combinations of concern. A total of fifty-seven socket weld mock ups of these combinations, CRES with CUNI filler metal and CUNI with CRES filler metal, were made with the filler metal removed and not removed and at various locations in the weld (back to second pass). The results are tabulated in enclosure (3) to enclosure (1). Although most welds "failed", i.e. cracks were seen at various stages of fabrication which would have halted the process, several welds made it through the entire welding and non destructive testing (NDT) process without defects being identified.

10. Understanding that defects could be contained within a shipboard joint without being detected, NNS&DDCo proceeded to perform fatigue testing on three combinations of socket weld joints, CUNI with CRES filler metal, CRES with CUNI filler metal and [REDACTED] with CUNI filler metal (the worst case strength mismatch). Testing is documented in Enclosure (4) to enclosure (1). In all cases, the entire root pass was welded with the incorrect material and is considered as a worst case scenario. All three combinations demonstrated leak before break characteristics. For CUNI and CRES base materials, the fatigue life met life of ship design cycles per the Naval Shipboard Piping Structural Design Manual. For [REDACTED] the worst case test sample met only 25 percent of design life cycles.

11. Although the fatigue testing validated that a potential failure would exhibit leak before break, the engineering analysis of enclosure (4) to enclosure (1) also provides additional rationale for the short term acceptability of several other critical systems. These systems/categories include SW joints that are non-isolable from the sea, non-remotely isolable joints that do not receive 360 degree radiographic (RT) inspection, SUBSAFE design review boundary (SSDR) SW joints where secondary stresses exceed 50 percent of allowable, and ship recovery systems (EMBT Blow, Steering and Diving Hydraulics and Flood Closure Hydraulics).

12. Enclosure (1) concludes that:

a. The instances of improper filler metal use are isolated cases but that no systemic or widespread problem exists.

b. The NNS&DDCo quality data shows that the filler metal processes are sound and provide "maximum reasonable assurance" that the material condition of welds is satisfactory.

c. The quality data is in alignment with the welding engineering mock up evaluations which confirms that in-process inspections will reliably identify cracks.

d. There are no significant differences between the VIRGINIA Class welding processes, controls, auditing or certification methodology and those used on service proven SSN 688 Class submarines.

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e. That the combination of historical occurrences of improper filler metal use, the review of objective quality evidence, the hardware reinspections performed on three VIRGINIA Class submarines and the mock up testing results provide "maximum reasonable assurance" that socket welded pipe joints are acceptable for continued unrestricted service.

13. Enclosure (1) requests concurrence that potential issues are limited to non-nuclear SW joints and approval that NNS&DDCo fabricated SW joints are acceptable for continued service on SSN 774, 775, 776 and 777 through 30 May 2008. Disposition of SW joints for life of ship for VIRGINIA Class will be addressed no later than 15 April 2008.

DISCUSSION – Supervisor of Shipbuilding, Conversion and Repair, USN, Newport News (SUPSHIPNN) Evaluation:

14. SUPSHIPNN Quality Assurance (QA) and Engineering Departments have reviewed enclosure (1) and the following comments are provided as related to the determination that the area of concern/risk for incorrect filler metal is limited to NNS&DDCo fabricated socket welded joints. The independent SUPSHIPNN Quality Assurance Assessment is contained in enclosure (2):

a. SUPSHIPNN concurs that there are no systemic filler metal issues affecting nuclear system welds. The differences in the process controls and oversight provided by the Quality Inspection Division personnel significantly reduce the risk of error. SUPSHIPNN QA department audits confirm this position.

b. SUPSHIPNN concurs that the structural welding process is generally sound and this position is confirmed by the QA department observations as noted in enclosure (2). SUPSHIPNN, however, does not concur with NNS&DDCo that no systemic issue exists. It is clear from the number of instances identified by both NNS&DDCo and SUPSHIPNN during this investigation that more rigid and formalized process controls and workmanship rigor should be invoked to minimize the number of welding issues. It should also be noted that while enclosure (1), paragraph 3.2.1.1 indicates that 11,440 structural records have been reviewed with only one instance of incorrect filler metal identified, the record system for structural welds is not as robust as it is for piping welds. Structural records indicate only the generic filler metal type to be used based on the weld procedure (e.g. MIL-10718M), however traceability to the actual wire used is not maintained by recording a unique identifier on the weld record (lot or MIC number). Additionally, the following comments are provided:

(1) Note that following issuance of enclosure (1), NNS&DDCo acknowledged that two errors existed. In paragraph 3.2.1.4, the second bullet should read "The two SUBSAFE welds were isolated instances. One was not attributable to a loss of filler metal control." In paragraph 3.2.2, page 7, third bullet, "...or SUBSAFE..." should be deleted from the last sentence and a new last sentence added stating "The two SUBSAFE welds were isolated instances and one was not attributable to a loss of filler metal control."

(2) Pg 6 & 7, Paragraph 3.2.2 – In paragraph 3.2.2 of enclosure (1), NNS&DDCo states that, "Joints with full penetration geometry are subject to a back gouge process, thus precluding the possibility of incorporating tack weld material in the final joint." SUPSHIPNN notes that this conclusion is contingent upon the assumption that each of the tack welds used is sized and oriented such that the back gouge process includes complete removal of each. NNS&DDCo has no documented procedural requirements in place to dictate the removal of all tack weld material.

(3) Pg 6 & 7, Paragraph 3.2.2 – NNS&DDCo states that for partial penetration joints, "any tacks made with under strength filler metal and not subsequently removed from these joints would have no

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significant effect on overall joint strength." SUPSHIPNN notes that no quantitative analysis is provided for this assertion. The effect on overall joint strength would be contingent upon the location of the under strength tack welds and the number and size of the under strength tack welds relative to the overall weld joint configuration.

c. SUPSHIPNN concurs that there are no systemic filler metal issues in the areas of castings or machinery and pressure vessels. SUPSHIPNN QA review of VIRGINIA Class quality data revealed no incidents of incorrect filler metal usage related to these areas.

d. SUPSHIPNN concurs with the NNS&DDCo rationale that class P-2 joints are governed by the same process as class P-1 and that the evaluation for technical acceptability of class P-1 joints can be extended to class P-2. However, it is the opinion of the SUPSHIPNN engineering and QA departments that the number of undiscovered defects will likely be higher in the class P-2 category based on the less stringent NDT performed and the likelihood that more proficient welders are utilized for joints requiring a high level of NDT.

e. SUPSHIPNN concurs that there are no systemic filler metal issues in the area of butt joints. As noted in enclosure (2), no instances of improper filler metal have been observed in this area and only two instances were identified by NNS&DDCo. Most of the SUPSHIPNN QA issues have involved filler metal control problems vice fabrication problems. Our findings coupled with the controls established for consumable inserts and the RT requirements for these joint types support the NNS&DDCo conclusion. SUPSHIPNN also concurs that in most cases, a 60 degree RT actually encompasses significantly more than 60 degrees. It is also our opinion that welders of similar proficiency would be assigned to 360 and 60 degree RT joints. Finally, NNS&DDCo performs a 60 degree minimum RT on all MIC Level 1 butt joints for VIRGINIA Class submarines.

f. Paragraph 10.3.8 of reference (a) permits the welder to incorporate cracked tack welds into the final root pass provided certain conditions are met. For information, NNS&DDCo Procedure W91/191, "Welding Piping, Machinery and Pressure Vessels", prohibits the welder from taking this action.

15. As noted above SUPSHIPNN concurs that this filler metal issue and its potential risks are limited to socket weld joints. The information provided in enclosure (1) in support of short term acceptance of all socket weld joints has been reviewed. The following comments are provided:

a. NNS&DDCo has reviewed a significant number of weld records as noted in enclosure (2) to enclosure (1). This includes 5,838 weld records and 697 in-process observations for VIRGINIA Class, and 2,204 P-1 records on SSN 777 with only two instances of incorrect filler metal noted. However, a review of the various VIRGINIA Class databases revealed an additional 14 occurrences (2 of which were butt joint related and are noted in 14.e above). While this review does not guarantee that the correct filler metal was utilized, it does provide an added level of confidence that the joints were fabricated properly. SUPSHIPNN, however, does not concur with the NNS&DDCo statement that this review demonstrates that no systemic problem exists. The lack of a formal reporting process for issues of this type and the allowance for undocumented self correction does not support the NNS&DDCo contention. While the process is considered to be generally sound, the number of issues identified following issuance of the highlight identified in paragraph 5.a herein demonstrates that issues exist with the process and that more rigid and formalized process controls and workmanship rigor must be invoked to minimize the number of welding issues in piping system welds.

b. Related to the discussion of paragraph 15.a, it is important to note that NNS&DDCo does not record hydrostatic failures which occur during "grooming" (i.e. preliminary air test). For NNS&DDCo, the

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Hydro Leak Database referred to in paragraph 4.1.6 of enclosure (1) only contains failures that occur during the official hydrostatic test. The same lack of data holds true for in process weld corrections. So long as the welder is working one joint on one day of his shift, repairs may be made without formal documentation. In general, until such time as a formal second party inspection takes place, such as a dye penetrant (PT) test of a joint root or final layer, the weld may be reworked as necessary and no record of the repair is made. Only repairs that follow a formal independent inspection are documented on the weld joint record. It is unknown how many grooming failures occur and therefore, SUPSHIPNN considers that NNS&DDCo does not have comprehensive data to support their claim that no systemic problem exists.

c. In addition to the record reviews, NNS&DDCo and Electric Boat (EB) performed weld surface material verification utilizing semi-quantitative analysis on SSN 777 (407 joints) and SSN 778 (393 joints) with no findings. Again, while this inspection, taken at a single small accessible location on the center of the weld, will not necessarily identify the dilution effect of an improper tack through several layers of weld, it provides assurance that the outermost layer is of the appropriate material and has not been significantly diluted by improper filler metal. It should be noted that samples were taken for the five major materials and encompassed both class P-1 and class P-2 joints.

d. Enclosure (3) to enclosure (1) identifies the base material/filler material combinations that have a propensity to crack and the 57 socket weld samples that were fabricated with varying degrees and locations of incorrect filler metal. While the majority of the samples would have failed at some point in the process, there were samples that passed all inspections without noting any defect. It should be noted that these samples and inspections were performed in a shop environment, by welders with knowledge of incorrect filler metal, and may not be indicative of shipboard conditions. While the data cannot be scientifically extrapolated, it is reasonable to assume the quality of shipboard welds would be no better than the test samples.

e. As a result of the welding engineering tests and the understanding that some defects may go unnoticed during fabrication, NNS&DDCo engineering performed fatigue testing on three material combinations fabricated as specified in enclosure (3) to enclosure (1). Enclosure (4) to enclosure (1) reports the results of this testing. In every case (CUNI with CRES filler metal, CRES with CUNI filler metal and [REDACTED] with CUNI filler metal), the joints exhibited a leak before break failure mode. These base metal/filler metal combinations also cover the majority of the incorrect filler metal combinations actually uncovered by NNS&DDCo and reported in enclosure (2) to enclosure (1). This provides maximum reasonable assurance that a catastrophic failure will not occur. It should also be noted that while the CUNI and CRES samples exceeded the life of ship cycles requirement, the [REDACTED] did not. The three [REDACTED] fatigue life samples yielded 25 percent, 50 percent, and 103 percent of the required service life cycles. For conservatism, NNS&DDCo has assumed the minimum of 25 percent. Based on a review of reference (b), SUPSHIPNN considers the testing to be valid in its demonstration of leak before break and valid for the short term regarding fatigue life. Life of ship fatigue acceptance may require additional testing.

f. In addition to the fatigue analysis, enclosure (4) to enclosure (1) provides an engineering evaluation of the following areas. SUPSHIPNN engineering concurs with the assessments noted below:

(1) Non-isolable hull integrity (HI) joints – Eighteen SW joints were identified in this category. All are in the Shaft Seal Water System and are ¾ NPS [REDACTED]. The consequence of failure would not endanger the ship or personnel. Fatigue testing supports near term acceptability.

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(2) **Evaluation of Failure of Piping in Critical Ship Recovery Systems - Evaluation of Failure of Piping in Critical Ship Recovery Systems** – NNS&DDCo engineering considers three systems, EMBT Blow systems, Steering and Diving Hydraulics, and Flood Closure Hydraulics, as critical to ship recovery and provide assessment for consequences of a weld joint failure. The Steering and Diving and Flood Closure Hydraulic systems are designed such that a single point failure will not incapacitate operation of the ship. Failure of Flood Closure hydraulics may result in loss of operation of the hull valve requiring manual operation of the back-up valve. EMBT Blow acceptance is rationalized based on conditions of paragraph (3) below and the added assurance obtained by the PT and weld metal verification performed on the two affected joints (see enclosure (1) paragraph 5.5.1).

(3) **Base Metal/Filler Metal Combinations** – NNS&DDCo engineering evaluates the effects of the various combinations on strength, corrosion, fatigue, etc. The executive summary concludes that based on the fact that only small amounts of improper filler metals have been found in the failures noted to date, near term service is acceptable. SUPSHIPNN engineering considers that the fatigue testing performed by NNS&DDCo provides maximum reasonable assurance that catastrophic failure of these joints will not occur. In addition, we concur with the general assumption that only a small amount of improper filler metal is likely to be present in any joint, however, SUPSHIPNN acknowledges that it is not possible to quantify the amount of improper filler metal that may exist.

(4) **Elimination of P-1 Butt Joints** – Engineering provides addition technical rationale in support of the elimination of P-1 butt joints from the issue. This section also provides an assessment of the 135 P-1 butt joints that do not require RT inspection. NNS&DDCo concludes that the risk and consequence of failure is low.

(5) **Evaluation of External Hydraulic Multi-Pipe Penetrators** – NNS&DDCo welds 6 multi-pipe CRES penetrators into the HY-100 steel sleeves. Acceptability is based on the fact that both the internal and external attachment welds would have to fail to produce leakage coupled with the fact that the penetrators have an outboard "shoulder" that prevents catastrophic failure (shoulder rests on the steel sleeve preventing its entry into the ship even if the welds fail).

(6) **Technical Assessment of Undersized Sockets** – NNS&DDCo reports on the locations of various undersized socket weld fittings where the socket face thickness is insufficient to obtain the "T" weld thickness requirement. NNS&DDCo identifies the risk of failure and concludes that no ship recovery issue exists.

(7) **Hull Integrity Closures Open to the Sea Below 200 Feet** – NNS&DDCo identifies 116 joints that are open to the sea below 200 feet and the type of closure (flood closure, hydraulic, manual) along with an assessment of failure. Acceptability is based on acceptable short term fatigue test results and the failure assessment provided therein.

RECOMMENDATION:

16. SUPSHIPNN has reviewed enclosure (1) and its enclosures. SUPSHIPNN has also reviewed internal QA data regarding our findings associated with weld filler metal issues on ships undergoing construction at NNS&DDCo and provides the following comments:

a. Both the SUPSHIPNN and NNS&DDCo findings indicate that there are process issues in both the structural and non-nuclear piping areas related to the control and use of filler material. However, the data also shows that there is no significant issue that would indicate that the NNS&DDCo welding process is unsatisfactory. SUPSHIPNN surveillance and process audits confirm that NNS&DDCo processes are

Subj: VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100 – WELD FILLER METAL CONTROL, RECOMMENDATION FOR CONTINUED CONSTRUCTION AND TESTING FOR SSN777, AND CONTINUED OPERATION FOR SSN774, SSN775 AND SSN776, FOR NAVSEA APPROVAL

generally acceptable but in need of improvement. As noted in enclosure (1), NNS&DDCo has taken several necessary steps to improve the process and the expectation is that additional, focused improvements will follow as awareness increases and data is collected.

b. SUPSHIPNN engineering concurs with the NNS&DDCo engineering assessments provided in enclosure (4) to enclosure (1). In the unlikely event that mismatched or under strength filler metal is contained in a SW joint, in particular one associated with ship recovery or personnel safety, the fatigue testing conducted provides assurance that an unintended material combination will not fail catastrophically.

17. The sum of the NNS&DDCo conducted quality process reviews, weld record reviews, shipboard material verifications, weld base/filler metal testing, fatigue testing and individual system failure risk evaluation coupled with the independent audit results provided by the SUPSHIPNN QA department provides maximum reasonable assurance that the NNS&DDCo fabricated SW joints are acceptable for unrestricted short term use. SUPSHIPNN concurs with the recommendations of paragraph 7 of enclosure (1) and recommends NAVSEA approval. Please note that a reply is requested not later than 27 November 2007.

18. SUPSHIPNN point of contact is [REDACTED] at telephone [REDACTED] e-mail [REDACTED] (piping issues), [REDACTED] at telephone [REDACTED] email [REDACTED] (structural issues) and [REDACTED] at telephone [REDACTED] email [REDACTED] (for NDT and QA audit issues).

S727
[REDACTED]
S. A. HEDGEPEETH
By Direction

Copy to:

NAVSEA 08E [REDACTED]
NAVSEA 08C [REDACTED]
NAVSEA PMS [REDACTED]
NAVSEA 05U [REDACTED]
NAVSEA 07Q [REDACTED]
NAVSEA 05M [REDACTED]
NAVSEA 05Z [REDACTED]
NRRO [REDACTED]

SUPSHIPNN Quality Assurance Department Assessment – VCS Weld Wire Issue

SUPSHIPNN QA Department conducts process and product audits as well as general surveillance of fitting, welding and nondestructive testing processes at NGNN. Attributes related to verification of correct filler metal usage and controls are included in each audit or surveillance related to welding. Instances where NNS&DDCO welders are observed by SUPSHIPNN QA using the incorrect filler metal are considered to be major findings and are documented via a Method B CAR which requires the correction of the defect, determination of the root cause and discussion of actions taken or planned by NNS&DDCO to correct the cause and prevent recurrence. The NNS&DDCO response to Method B CARs is required to be formalized and in writing and is subject to verification and acceptance by SUPSHIPNN QA. SUPSHIPNN QA maintains a database of observations and defects for each functional area and uses this data to determine the direction and scope of future Government QA actions, such as planned surveillances and audits. SUPSHIPNN QA has reviewed this data for trends related to incorrect filler metal usage and control. This review focused on four areas; A review of all VCS Method B CARs for instances where SUPSHIPNN observed the deposition of incorrect filler metal; A review of filler metal control observations and defects from both audits and surveillances recorded for VCS since January 2002 for trends; A review of filler metal control observations and defects from both audits and surveillances recorded for all product lines since January 2002 for trends related to the filler metal control process which includes those that were not related to a particular hull (nonshipboard); and a review of nuclear and non-nuclear radiography audits and surveillances conducted by SUPSHIPNN. The results of these reviews are summarized below:

a. All Method B CARs for VCS were reviewed for issues relative to filler metal control for nuclear and non-nuclear pipe and structural welding applications since the beginning of the program. The following five occurrences were found that reported incorrect filler metal usage, all applicable to non-nuclear structural applications:

1. CAR SSN-774-0008Q dated 14 March, 2001 documented an X-32 tack welder using MIL-11018 in lieu of MIL-10718 on a service trunk door structure.
2. CAR SSN-775-0012N dated 26 March 2001 documented an X-18 welder tacking with 7018-M in lieu of MIL-11018 on a temporary fixture to the reactor bulkhead flange.
3. CAR SSN-775-0009Q dated 9 April 2002 documented an X-42 tack welder using MIL-11018 in lieu of MIL-10718 on temporary OSS pipe hangers to HY-100 plating.
4. CAR SSN-775-0011Q dated 14 August 2002 documented an X-31 tack welder using MIL-11018 in lieu of MIL-10718 to weld a temporary attachment to the pressure hull.
5. CAR SSN-776-0008Q dated 6 October 2003 documented an X-10 welder welding a fabrication scar repair on HSS structure with MIL-11018 in lieu of MIL-7018.

These occurrences are also addressed by the NNS&DDCO assessment provided by Enclosure (2) paragraph 2.c. There were no occurrences where SUPSHIPNN observed the deposition of incorrect filler metal on machinery, pressure vessel, piping system, or casting repair welds for VCS since the beginning of the program.

b. Observations and defects recorded in the TeamUp database for audits and surveillances for VCS from January 2002 to present were reviewed for trends related to filler metal control with the following results:

1. Nuclear Pipe welding –There were a total of 1,847 observations recorded from January 2002 to present with zero defects specifically related to filler metal control noted.
2. Nuclear Structural welding –There were a total of 1,720 observations recorded from January 2002 to present with zero defects specifically related to filler metal control noted.
3. Non-nuclear Pipe welding – There were a total of 20,509 observations recorded from January 2002 to present with five defects specifically related to filler metal control noted. These defects pertained to improperly stored and segregated MC-1 and standard consumable inserts (commingled in a foreman's desk drawer) and failure to maintain a consumable insert storage cabinet locked.
4. Non-nuclear Structural welding – There were a total of 13,259 observations recorded from January 2002 to present with 39 defects specifically related to filler metal control noted. Five occurrences

SUPSHIPNN Quality Assurance Department Assessment – VCS Weld Wire Issue

dealt with incorrect filler metal deposited that were reported on Method B CARs as discussed in paragraph 4.a above. The remainder of these defects were related to filler metal found adrift, disposed of improperly, obtained from source other than issue station (shared), or spool wire left on the welding machines at end of shift and not covered.

c. Observations and defects recorded in the TeamUp database for audits and surveillances for all product lines (includes CVN construction and overhaul and SSN construction, fleet support and DMP) and nonshipboard (not specific to an individual project or hull, which includes issue stations, receiving and storage areas) from January 2002 to present were reviewed for trends related to filler metal control. There were two additional occurrences of incorrect filler metal usage found as reported on the following CARs:

1. CAR CVN-89-0100Q dated 28 April 2003 documented a welder using MIL-70S filler metal in lieu of MIL-11018 to weld bulkhead sleeves and hangers to a HY-100 bulkhead.
2. CAR CVN-77-0026Q dated 12 August 2005 documented a welder at Newport News Industrial (NNI) using 7018M in lieu of MIL-11018 to weld backing bars to HY-80 hatch assemblies.
3. A review of Method B CARs (major) recorded during the period from January 2002 to present for all projects shows that there were 17 issued that related to filler metal control. A review of data for Method A (minor) and B CARs recorded during the same period for all projects shows that there were 213 non-nuclear defects related to filler metal control and 62 nuclear defects. Of defects reported via both methods, the most recurrent were:
 - o Filler metal adrift – 77 occurrences
 - o Storage of filler metal (at issue stations and/or warehousing) – 47 occurrences
 - o Electrode ovens/logs not in accordance with procedure – 28 occurrences
 - o Failure to properly dispose of filler metal or mark as scrap – 27 occurrences
 - o Improper storage of consumable inserts – 22 occurrences
 - o Welder failed to verify type of filler at issue station – 15 occurrences
4. Based on the reviews conducted by SUPSHIPNN QA of observation data, few instances of incorrect filler metal deposition are observed during audits and surveillances. Of those instances that were noted, all were related to structural applications with most of those being tack welds or temporary attachment welds. Weaknesses in storage, issue and housekeeping have been addressed with NNS&DDCO via annual audit reports and associated CARs and some process improvements have been undertaken as a result of these findings. Continued attention to process improvement for filler metal control by NNS&DDCO is required.

d. Nuclear and Non-nuclear Radiography audits and surveillances – RT film is reviewed by SUPSHIPNN QA on a monthly audit basis utilizing the recommended sample sizes for NAVSEA SUBSAFE Certification Audits as a guide. Sample selection is prioritized based on the following:

- o Near misses – NNS&DDCO documents near misses where an RT indication was judged to be acceptable, but was close to the reject criteria. These are chosen as part of the sample as an opportunity to evaluate the film interpreter for correct disposition of the joint.
- o SUBSAFE/Hull Integrity – These joints are given priority in the sample based on criticality.
- o [REDACTED] joints – Due to problems with incomplete fusion of the consumable insert experienced early in VCS program at both shipbuilders, any [REDACTED] welds in the population are sampled.
- o Bimetallic joints
- o Joints with a history of repair cycles or cuts

SUPSHIPNN Quality Assurance Department Assessment – VCS Weld Wire Issue

A review of observations and defects recorded for VCS since program start-up indicates that SUPSHIPNN has observed no RT interpretation deficiencies related to incorrect filler metal deposition. Total nuclear RT observations recorded for VCS since January 2000 is 1,616 with 1 defect related to documentation errors. Total non-nuclear RT observations recorded for VCS since January 2000 is 6,574 with 7 defects, which were related to documentation and/or technique deficiencies. The non-nuclear total includes 4,259 SUBSAFE observations and 314 DSS-SOC observations. The SUPSHIPNN RT Examiner independently reviewed the films for the 15 butt weld joints that were rejected for cracks and agreed with the conclusions reached by the NNS&DDCO Examiner and Welding Engineering. Based on the review of RT data and the review of RT joints with defects, SUPSHIPNN has a high level of confidence in the RT program at NGNN. It should be noted here that piping system joints less than 3.5 inches that only require 60 degree radiography are interpreted in their entirety (outside of area of interest including sidewall images) for cracks and other defects. This results in much greater than 60 degree coverage in most cases. When questionable areas are noted outside of the area of interest during partial radiography, additional shots are accomplished to determine if a defect exists. When repairs are made as a result of partial radiography the entire joint (360 degrees) must be radiographed after repairs are accomplished.



DEPARTMENT OF THE NAVY
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR, USN
4101 WASHINGTON AVENUE, BUILDING 2
NEWPORT NEWS, VIRGINIA 23607-2787

IN REPLY REFER TO:

9074
Ser SSN 774CI-
280/015696
28 Nov 07

From: Supervisor of Shipbuilding, Conversion and Repair, USN, Newport News
To: Program Executive Office, Submarines (PMS 450)
614 Sicard Street, SE, Stop 7026
Washington Navy Yard, DC 20376-7026
Attention: [REDACTED] PMS 450

Subj: VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100 - WELD
FILLER METAL CONTROL, RESPONSE TO SPECIFIC SSN 777 QUALITY ASSURANCE
ACTIONS ASSIGNED BY NAVSEA DURING REFERENCE (B), FOR NAVSEA APPROVAL

Ref: (a) NNS&DDCo ltr Ser N021499 of 26 Nov 07
(b) SUPSHIPNN ltr 9074 Ser SSN 774CI-280/015696 of 26 Nov 07

Encl: (1) NNS&DDCo ltr Ser N021501 of 28 Nov 07

1. Reference (a), forwarded to Naval Sea Systems Command (NAVSEA) by reference (b), identified the results of an investigation performed by Newport News Shipbuilding and Dry Dock Company (NNS&DDCo) following the identification of several instances of the use of incorrect filler metal in socket weld (SW) joints aboard VIRGINIA Class submarines. Following discussions with NAVSEA and Supervisor of Shipbuilding, Conversion and Repair, USN, Newport News (SUPSHIPNN) personnel on 27 November 2007, NNS&DDCo agreed to perform two additional actions and report their findings to the government.

2. Enclosure (1) is forwarded for action and provides the results of the required Quality Assurance actions. Enclosure (1) identifies that eleven instances of incorrect filler metal use since the 2 November 2007 shipyard-wide alert, noted in reference (a), was issued. Enclosure (1) also reports the satisfactory dye penetrant (PT) test results performed on all accessible (47 out of 50 total) Emergency Main Ballast Tank (EMBT) Blow System air actuation lines as well as all accessible (4 out of 4 total) 2-inch EMBT System SW joints inboard of the air flasks. There were no PT indications present in any of the 54 accessible joints. In addition to the above, NNS&DDCo performed weld surface material verification tests, where space permitted, on 53 joints, with satisfactory results.

3. Based on the number of unplanned event meetings, SUPSHIPNN notes that NNS&DDCo is accomplishing the actions outlined in the shipyard-wide alert to increase management awareness of these issues. Additionally, SUPSHIPNN QA personnel observed the PT testing performed by NNS&DDCo on all but three of the 1/4-inch joints and confirms the results presented in enclosure (1).

Subj: VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-95-C-2100 - WELD
FILLER METAL CONTROL, RESPONSE TO SPECIFIC SSN 777 QUALITY ASSURANCE
ACTIONS ASSIGNED BY NAVSEA DURING REFERENCE (B), FOR NAVSEA APPROVAL

4. SUPSHIPNN point of contact is [redacted] at telephone [redacted] e-mail
[redacted] (piping issues), [redacted] at telephone [redacted] email
[redacted] structural issues) and [redacted] at telephone [redacted]
email [redacted] (for NDT and QA audit issues).

[redacted]
S. A. HEDGEPEETH
By direction [redacted]

Copy to:

NAVSEA 08E [redacted]
NAVSEA 08C [redacted]
NAVSEA PMS460TA [redacted]
NAVSEA 05U [redacted]
NAVSEA 07Q [redacted]
NAVSEA 06M [redacted]
NAVSEA 06Z [redacted]
NRRO [redacted]

OPTIONAL FORM 88 (7-99)

FAX TRANSMITTAL

[redacted] 1 of pages [redacted]

From	[redacted]
To	[redacted]
Page #	[redacted]

NSN 7540-01-280-101

GENERAL SERVICES ADMINISTRATION



DEPARTMENT OF THE NAVY
PROGRAM EXECUTIVE OFFICER (SUBMARINES)
814 SICARD STREET SE
WASHINGTON NAVY YARD DC 20376-7004

IN REPLY REFER TO

9074
Ser 450/1058
29 NOV 2007

From: Program Executive Officer, Submarines
To: Northrop Grumman Corporation, Newport News Shipbuilding
(Attn: [REDACTED] Dept. 062)
Via: Supervisor of Shipbuilding, Conversion and Repair, USN
Newport News, VA (Attn: [REDACTED] Code 159)

To: Electric Boat Corporation (Attn: [REDACTED] Dept. 601)
Via: Supervisor of Shipbuilding, Conversion and Repair, USN
Groton, CT (Attn: [REDACTED] Code 156)

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO.
N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL FOR
CONTINUED CONSTRUCTION AND TESTING FOR SSN 777 AND FOR
CONTINUED OPERATION FOR SSN 774, SSN 775 AND SSN 776

Ref:

- (a) NGNN ltr N021499 "VIRGINIA CLASS SUBMARINE PROGRAM;
CONTRACT NO. N00024-96-C-2100 - WELD FILLER METAL
CONTROL, RECOMMENDATION FOR CONTINUED CONSTRUCTION
AND TESTING FOR SSN777, AND CONTINUED OPERATION FOR
SSN774, SSN775 AND SSN776, FOR NAVSEA APPROVAL",
dated 26 November 2007
- (b) SOSNN ltr Ser SSN 774CL-260/015604, "VIRGINIA CLASS
SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100 -
WELD FILLER METAL CONTROL, RECOMMENDATION FOR
CONTINUED CONSTRUCTION AND TESTING FOR SSN777, AND
CONTINUED OPERATION FOR SSN774, SSN775 AND SSN776,
FOR NAVSEA APPROVAL", dated 27 November 2007
- (c) NGNN ltr N021501 "VIRGINIA Class Submarine Program;
Contract No. N00024-96-C-2100 - Weld Filler Metal
Control, Response to Specific SSN 777 Quality
Assurance Actions Assigned by NAVSEA During
Reference (b), for NAVSEA Approval", dated 28
November 2007
- (d) SOSNN ltr Ser SSN774CL-260/015696 "VIRGINIA Class
Submarine Program; Contract No. N00024-96-C-2100 -
Weld Filler Metal Control, Response to Specific SSN
777 Quality Assurance Actions Assigned by NAVSEA
During Reference (b), for NAVSEA Approval", dated 28
November 2007

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO. N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL FOR CONTINUED CONSTRUCTION AND TESTING FOR SSN 777 AND FOR CONTINUED OPERATION FOR SSN 774, SSN 775 AND SSN 776

1. Purpose: Reference (a), forwarded by reference (b), requests NAVSEA concurrence (for the short term) that non-nuclear socket welded pipe joints fabricated by Northrop Grumman Newport News (NGNN), are acceptable for continued testing and operation on VIRGINIA Class Submarines. Reference (a) also requests that NAVSEA concur that the weld filler metal control problem discussed herein is limited to non-nuclear socket welds in accordance with the rationale provided.

2. NGNN Discussion:

a. NGNN states that a comprehensive quality system review of VIRGINIA Class Submarine weld records, audit results, problem reports, and other manufacturing data, including hardware inspections on SSN 775, SSN 777 and SSN 778 was performed. Utilizing the combined results of that review, NGNN asserts that welds in structure, nuclear piping, non-nuclear castings, and non-nuclear machinery and pressure vessels are not impacted by the recent failures and that any problem resides within non-nuclear piping welds. Reference (a) provides rationale to eliminate category P-2 piping welds because they are not critical and all P-1 piping butt welds from the area of potential concern which narrows the final analysis to non-nuclear piping system socket welds. NGNN then performed laboratory analyses in order to determine the effectiveness of in-process inspections and testing in identifying cracks due to incorrect filler metal and performed fatigue testing to determine the likely failure mode in the event a contaminated weld is not identified by NDT or testing. Engineering evaluations were performed on VIRGINIA Class systems with a focus on systems critical to ship recovery.

b. Newport News concludes that there are isolated cases of the improper use of filler metal over an extended period of time which is not indicative of a systemic or widespread problem. The checks and balances built into the NGNN process minimize the potential for improper filler metal to have been used in completed joints. The Quality data shows that the NGNN welding filler metal processes are sound and provide maximum reasonable assurance that the material condition of welds is satisfactory. In the area of pipe socket welded joints, reference (a) provides additional qualitative and technical assurance to establish acceptance for continued construction and testing of SSN 777 currently under construction and continued operation for SSN 774, SSN 775 and SSN 776. The Quality data shows that cracking

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO. N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL FOR CONTINUED CONSTRUCTION AND TESTING FOR SSN 777 AND FOR CONTINUED OPERATION FOR SSN 774, SSN 775 AND SSN 776

would likely be identified by in-process inspections/test. If not detected, joints can be expected to reliably exhibit leak before break behavior and will not impact safe operation of VIRGINIA Class submarines.

c. NGNN requests approval for the continued unrestricted operation of SSN 774, SSN 775 and SSN 776 and continued construction, testing and unrestricted operations of SSN 777 through May 30, 2008. Life of ship disposition for these and other VIRGINIA Class submarine new construction assets will be addressed via separate correspondence no later than 15 April 2008.

3. SUPSHIPNN Discussion:

a. Both the SUPSHIPNN and NGNN findings indicate that there are process problems in both the structural and non-nuclear piping areas related to the control and use of filler material. However, the data also shows that there is no significant problem that would indicate that the NGNN welding process is unsatisfactory. SUPSHIPNN surveillance and process audits confirm that NGNN processes are generally acceptable but in need of improvement.

b. SUPSHIPNN engineering concurs with the NGNN engineering assessments provided in enclosure (4) to reference (a). In the unlikely event that mismatched or under strength filler metal is contained in a socket welded joint, in particular one associated with ship recovery or personnel safety, the fatigue testing conducted provides assurance that an unintended material combination will not fail catastrophically.

c. The sum of the NGNN conducted quality process reviews, weld record reviews, shipboard material verifications, weld base/filler metal testing, fatigue testing and individual system failure risk evaluation coupled with the independent audit results provided by the SUPSHIPNN QA department provides maximum reasonable assurance that the NGNN fabricated socket weld joints are acceptable for unrestricted short term use. SUPSHIPNN concurs with the recommendations of paragraph 7 of reference (a) and recommends NAVSEA approval.

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO. N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL FOR CONTINUED CONSTRUCTION AND TESTING FOR SSN 777 AND FOR CONTINUED OPERATION FOR SSN 774, SSN 775 AND SSN 776

4. PMS450 Discussion:

a. PMS450 does not concur with NGNN that improper use of filler metal over an extended period of time is not indicative of a systemic problem. As stated by SUPSHIP in reference (b), the lack of a formal reporting process for problems of this type and the allowance for undocumented self-correction do not support the NGNN contention. Also, since NGNN Trades personnel were directed to report all filler metal issues to engineering and management for resolution on 2 November 2007, the data gathered to date (11 incorrect filler metal issues) reveals a systemic problem with NGNN's process that needs to be addressed. This body of information indicates to PMS450 that NGNN's material control is marginal. PMS 450 does not agree that there is maximum reasonable assurance that the material condition of welds are satisfactory based on quality data as asserted in reference (a). Acceptance of the welds per the action of this letter relies on the detailed engineering assessments, testing, and additional inspections to substitute for the normal certification process that does not account for questionable weld filler metal material control.

b. The NAVSEA comments related to short term acceptability were discussed during a meeting between NAVSEA, SUPSHIP, NGNN and EB on 27 November 2007. PMS450 assigned several actions for NGNN to address in the life of ship approval letter. During this meeting, NAVSEA concurred with NGNN's rationale in reference (a) that the short term technical concerns with weld metal filler control is limited to non-nuclear P-1 socket welds.

c. Based on the weaknesses in NGNN's processes and the limitations of the NGNN mock-up test results, there is a possibility that incorrect filler metal may be present in NGNN fabricated socket welds that could compromise integrity for short term service. NGNN concludes that for short term operation, joints can be expected to reliably exhibit leak before break behavior and will not impact safe operation of VIRGINIA Class submarines. PMS450 agrees with the NGNN engineering assessment in reference (a), Enclosure (4) on the critical systems needed for ship recovery, all of which involve CRES, CuNi or [REDACTED] materials, that the leak before break failure mode under pressure and flexural loading is reasonable, except in locations where a leak would not be detected until the system is needed to perform. Since the un-pressurized portion of the Emergency Main Ballast Tank (EMBT) actuation system does not

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO. N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL FOR CONTINUED CONSTRUCTION AND TESTING FOR SSN 777 AND FOR CONTINUED OPERATION FOR SSN 774, SSN 775 AND SSN 776

see pressure until the Emergency Blow System is needed to recover the ship, a leak would not be detected in time; therefore, additional assurance of the integrity of these welds is required. Also, additional assurance is required for the CRES socket weld joints in the EMBT system inboard of the hull, between the Air Flasks and the HP Air Header valves since these high pressure air joints are not remotely isolable.

d. PMS450 directed NGNN to perform liquid penetrant inspection (PT), reporting any indications, on the accessible NGNN fabricated socket welds in the EMBT actuation system and also the accessible NGNN fabricated CRES socket welds in the EMBT system between the Air Flasks and HP Air Header valves. The results of those inspections are documented in reference (c), and as forwarded in reference (d), SUPSHIPNN QA personnel observed the PT testing performed by NGNN on all but 3 of the 1/4-inch EMBT actuation system joints and confirms the results. NGNN performed PT on 51 out of 54 NGNN fabricated joints (three were inaccessible) and performed material verification on 49 NGNN fabricated joints on SSN 777. Based on the successful PT inspections and material verifications on SSN 777, PMS450 concurs that SSN 777 is SAT-FOR-SEA. PMS450 notes that these results only provide some increased confidence for short term service. These results have not been accepted as resolving concerns for presence of incompatible filler material for long term service. These joints on SSN 774, SSN 775 and SSN 776 shall be PT inspected prior to the respective ship's next underway.

e. Prior to submittal of reference (a), PMS450 directed NGNN to identify the non-isolable, hull integrity joints. The only non-isolable hull integrity joints are located in the Shaft Seal Water (SSW) Cooling System (18 joints total). To provide adequate assurance on the acceptability of these joints, NGNN has performed PT inspections and material verification via X-Ray fluorescence on the 18 SSW joints on SSN 775 and SSN 777 and determined they were acceptable. Per reference (a), paragraph 5.2, these joints on SSN 774 and SSN 776 were fabricated by EB and do not require re-inspection.

5. PMS450 Action: PMS450 approves continued construction and testing for SSN 777 until life of ship acceptability has been determined. PMS450 approves continued operation of SSN 774, SSN 775 and SSN 776, subject to satisfactory inspection of the aforementioned joints by PT inspection with no indications,

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO. N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL FOR CONTINUED CONSTRUCTION AND TESTING FOR SSN 777 AND FOR CONTINUED OPERATION FOR SSN 774, SSN 775 AND SSN 776

until life of ship acceptability has been determined for these hulls. PMS450 will address these inspections on SSN 774 via separate correspondence.

6. Request for NGNN Action: NGNN shall submit their final, life of ship recommendation for the VIRGINIA Class to NAVSEA for approval by 15 April 2008.

7. Request for EB Action: EB shall initiate liabilities against SSN 775 and SSN 776 to accomplish the aforementioned PT testing on the EMBT system joints prior to the respective ship's next underway. Upon completion of the PT, EB shall submit the results to SUPSHIP Groton for review/evaluation. If unsatisfactory results are obtained, EB shall immediately notify NAVSEA for further guidance.

8. Point of Contact: The PMS450 point of contact for this correspondence is [REDACTED] at [REDACTED]

9. The requirements of this letter do not authorize any changes in the terms, conditions, delivery schedule, price or amount of the subject contract or any other Government contract. In the event that you consider that these requirements represent a change for which you are entitled to an equitable adjustment, you are to comply with the requirements of the Notification of Changes clause on the contract.

[REDACTED]
By direction

Copy to:

NGNN [REDACTED] Dept. 011; [REDACTED] Dept. 062)
EB [REDACTED] D601; [REDACTED] Dept. 601; [REDACTED] Dept.
686; [REDACTED] Dept. 601)



DEPARTMENT OF THE NAVY
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR, USN
4101 WASHINGTON AVENUE, BUILDING 2
NEWPORT NEWS, VIRGINIA 23607-2767

IN REPLY REFER TO:

9074
Ser SSN 774C1-
260/016286
10 Dec 07

From: Supervisor of Shipbuilding, Conversion and Repair, USN, Newport News
To: Program Executive Office, Submarines (PMS 450)
614 Sicard Street, SE, Stop 7026
Washington Navy Yard, DC 20376-7026
Attention: [REDACTED] PMS 450

Subj: VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-86-C-2100 - WELD
FILLER METAL CONTROL, EVALUATION OF RECENT FINDINGS ON SSN774 AND SSN 779
AS RELATED TO THE BASIS FOR APPROVAL PROVIDED BY NAVAL SEA SYSTEMS
COMMAND (NAVSEA), FOR NAVSEA APPROVAL

Ref: (a) NNS&DDCo ltr Ser N021499 of 26 Nov 07
(b) NNS&DDCo ltr Ser N021601 of 28 Nov 07
(c) NAVSEA ltr 9074 Ser 450/1068 of 29 Nov 07

Encl: (1) NNS&DDCo ltr Ser N021546 of 10 Dec 07

1. Enclosure (1) is forwarded for action.

BACKGROUND:

2. Reference (a) identified concerns associated with weld filler metal control practices at Newport News Shipbuilding and Dry Dock Company (NNS&DDCo). These concerns became highlighted following Electric Boat's reporting of the failure of two NNS&DDCo manufactured socket weld (SW) joints aboard NEW HAMPSHIRE (SSN 778). Reference (a) documented the welding quality and process controls, welding process audit results, shipboard filler material validation, special welding record reviews, laboratory testing and engineering analysis that was performed by NNS&DDCo to ensure that welds accomplished by NNS&DDCo were acceptable for short term use. Utilizing the combined results of that review, NNS&DDCo made the technical argument that welds in structure, nuclear piping, non-nuclear castings, and non-nuclear machinery and pressure vessels are not impacted by these recent failures and that any issue that may exist resides within the non-nuclear piping weld arena. Reference (a) further provided rationale to eliminate category P-2 piping welds and all butt welds from the area of potential concern and narrowed the final analysis to non-nuclear piping system class P-1 socket welds. Reference (b) provided additional supporting documentation as requested by NAVSEA during the 27 November 2007 meeting held in Washington, DC to review the issue.

3. Reference (c) provided NAVSEA approval for continued construction and testing of NORTH CAROLINA (SSN 777) until life of ship acceptability has been determined. Reference (c) also approves continued operations of USS VIRGINIA (SSN 774), USS TEXAS (SSN 775) and USS HAWAII (SSN 776) (subject to satisfactory completion of certain inspections) until life of ship acceptability has been

Subj: VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100 - WELD FILLER METAL CONTROL, EVALUATION OF RECENT FINDINGS ON SSN 774 AND SSN 779 AS RELATED TO THE BASIS FOR APPROVAL PROVIDED BY NAVAL SEA SYSTEMS COMMAND (NAVSEA), FOR NAVSEA APPROVAL

determined. Reference (c) notes that the NNS&DDCo final, life of ship recommendation must be submitted for NAVSEA approval no later than 15 April 2008.

4. While conducting inspections required by reference (c), a 2-inch CRES SW copper poisoned joint (EMBT-70795) was discovered on USS VIRGINIA (SSN 774). Shortly thereafter, a 2-inch CRES SW copper poisoned joint was identified on NEW MEXICO (SSN 779). Subsequent discussions by the technical communities led to additional required actions including specific inspections, repairs and technical evaluations, all of which must be completed to the government's satisfaction prior to certification of any VIRGINIA Class submarine.

DISCUSSION:

5. Enclosure (1) provides the NNS&DDCo technical justification that the recent SSN 774 and SSN 779 issues are within the scope of the original assumptions and recommendations of reference (a), as approved by reference (c). Enclosure (1) provides the shipbuilders' assessment of the additional inspections required by reference (c) along with the additional assurance actions that followed discovery of the SSN 774 and SSN 779 copper poisoned joints. The additional assurance items included:

a. Removal of interferences to allow dye penetrant (PT) inspection of previously inaccessible Emergency Main Ballast Tank (EMBT) Blow System air actuation line SW joints on SSN 774 through SSN 777

b. Performance of grinding and inspections of 2-inch SW joints on SSN 774 and SSN 775 that failed PT inspection.

c. Performance of a comparison of the PT methods used by NNS&DDCo and Electric Boat (EB) to ensure that the apparent differences in inspection results are understood and to ensure both meet specification requirements.

d. Review of the results of the recent findings on SSN 774 and SSN 779 to determine if the assumptions and technical rationale presented in reference (a) are still valid.

6. In enclosure (1), NNS&DDCo and EB provide the following:

a. Enclosure (1) reports that all required SW joint inspections have been completed except for one 1/4-inch EMBT joint on SSN 775 and three joints (two 1/4-inch and one 1/2-inch) on SSN 776. Enclosure (1) concludes that these outstanding actions should have no impact on upcoming SSN 777 key events.

b. Enclosure (1) contains the results of the grinding and PT inspections of the 2-inch SW joints on SSN 774 and SSN 775. The shipbuilders note that SSN 774 joint EMBT-70795 continued to show PT indications and was removed. Macrographs of the weld identified what appears to be a small amount of copper contamination. Enclosure (1) also indicated that while SSN 775 joint EMBT-20180 shows various PT indications, only one smear test showed the presence of elevated copper. Subsequent smear tests and quantitative abrasive testing in the ground area were consistent with stainless steel material and did not show elevated levels of copper. Nonetheless, this joint will be removed and the weld analyzed. In both cases, NNS&DDCo and EB argue that these joints are within the bounds of reference (a).

c. Enclosure (1) provides the report on the comparison of PT materials and techniques utilized by NNS&DDCo and EB inspectors and concludes that while there is some variability in results, both shipyards have acceptable PT programs.

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d. NNS&DDCo provides technical assessment of the SSN 774 (EMBT-70796) and SSN 779 (AHP-21010) joints that failed PT inspection due to copper contamination. For SSN 774, NNS&DDCo notes that the macrographs for EMBT-70796 compared very favorably to macros of the joints that were fatigue tested as documented in reference (a). The cracking was determined to be similar in location, nature and extent. NNS&DDCo concludes that this joint is within the bounds of the reference (a) assumptions and recommendations. Regarding SSN 779, NNS&DDCo notes that the critique held following in-process PT failure found that the welder applied 1 to 3 beads of a copper bearing filler to a low spot on a nearly finished joint. Since the amount of incorrect filler metal was limited in both depth and circumference, NNS&DDCo concludes this joint also falls within the bounds of the reference (a) assumptions and recommendations.

RECOMMENDATION:

7. SUPSHIPNN has reviewed enclosure (1) offers the following comments/recommendations:

a. SUPSHIPNN concurs that the additional instances of copper contamination identified on SSN 774 and SSN 779 do not invalidate the basis for short term acceptance recommended in reference (a) and approved by reference (c).

b. SUPSHIPNN recommends that SSN 777 be approved for continued construction and testing until life of ship acceptability has been determined. SUPSHIPNN further recommends that SSN 774 be approved for continued operation until life of ship acceptability has been determined.

c. SUPSHIPNN concurs with the report and conclusions contained in the comparison of PT materials and techniques as documented in enclosure (4) to enclosure (1).

d. SUPSHIPNN concurs that, pending satisfactory completion of the outstanding SSN 775 and SSN 776 joint inspections, each respective submarine is acceptable for continued operations until life of ship acceptability has been determined.

e. SUPSHIPNN does not concur that SSN 776 Lockout Trunk (LOT) is acceptable for unrestricted service. Acceptance of the SSN 776 LOT will be the subject of separate correspondence.

8. SUPSHIPNN recommends NAVSEA approval of the enclosure (1) recommendation as modified by paragraph 7 herein. Your response is requested no later than 11 December 2007. SUPSHIPNN points of contact are [redacted] telephone [redacted] e-mail [redacted] (for issues) and [redacted] telephone [redacted] e-mail [redacted] (for non destructive testing and quality assurance audit issues).

[redacted]
S. A. HEDGEPEETH
By direction [redacted]

Copy to: (See sheet 4)

Subj: VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-06-C-2100 - WELD
FILLER METAL CONTROL, EVALUATION OF RECENT FINDINGS ON SSN774 AND SSN 779
AS RELATED TO THE BASIS FOR APPROVAL PROVIDED BY NAVAL SEA SYSTEMS
COMMAND (NAVSEA), FOR NAVSEA APPROVAL

Copy to:

NAVSEA 08E [REDACTED]

NAVSEA 08C [REDACTED]

NAVSEA PMS450TA [REDACTED]

NAVSEA 05U [REDACTED]

NAVSEA 07Q [REDACTED]

NAVSEA 05M [REDACTED]

NAVSEA 05Z [REDACTED]

NRRO [REDACTED]

To: [REDACTED]

From: [REDACTED]

5 pages including this cover

Here it is!



DEPARTMENT OF THE NAVY
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR, USN
4101 WASHINGTON AVENUE, BUILDING 2
NEWPORT NEWS, VIRGINIA 23607-2787

IN REPLY REFER TO:

9074
Ser SSN 774CI-
260/016329
11 Dec 07

From: Supervisor of Shipbuilding, Conversion and Repair, USN, Newport News
To: Newport News Shipbuilding and Dry Dock Company
Attn: [REDACTED] K70

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100;
WELD FILLER METAL CONTROL, APPROVAL OF EVALUATION OF RECENT FINDINGS ON
SSN 774 AND SSN 779 AS RELATED TO THE BASIS FOR SHORT TERM ACCEPTANCE

Ref: (a) NNS&DDCo ltr Ser N021546 of 10 Dec 07
(b) NNS&DDCo ltr Ser N021499 of 26 Nov 07
(c) NNS&DDCo ltr Ser N021538 of 4 Dec 07

Encl: (1) NAVSEA ltr 9074 Ser 450T2M/1098 of 11 Dec 07

1. Enclosure (1) is forwarded for action in response to reference (a). Enclosure (1) concurs with the reference (a) conclusion that the additional findings of incorrect filler metal in the 2-inch socket weld joints aboard USS VIRGINIA (SSN 774) and NEW MEXICO (SSN 779) are consistent with the findings and conclusions of reference (b). Enclosure (1) approves Newport News Shipbuilding and Dry Dock Company (NNS&DDCo) to continue with construction and testing for NORTH CAROLINA (SSN 777) until life-of-ship acceptability has been determined. Per reference (b) and enclosure (1), the NNS&DDCo recommendation must be accomplished no later than 15 April 2008.

2. Enclosure (1) also concurs:

a. That SSN 774 is acceptable for continued operation until life-of-ship acceptability has been determined.

b. That USS TEXAS (SSN 775) and USS HAWAII (SSN 776) are acceptable for continued short term operations pending completion of the remaining joint inspections on each respective ship.


c. That the SSN 776 Lockout Trunk is not acceptable for unrestricted service and that acceptability, as requested by reference (c), will be addressed by separate correspondence.

3. Note that enclosure (1) requires that NNS&DDCo ensure that a liability for SSN 777 exists and is coded for delivery. At delivery, NNS&DDCo shall submit a departure from specification to Supervisor of Shipbuilding, Conversion and Repair, USN, Newport News (SUPSHIPNN). This departure shall address short term acceptability pending completion of the life-of-ship evaluation.

4. SUPSHIPNN point of contact is [REDACTED] telephone [REDACTED] e-mail [REDACTED]

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100;
WELD FILLER METAL CONTROL, APPROVAL OF EVALUATION OF RECENT FINDINGS ON
SSN 774 AND SSN 779 AS RELATED TO THE BASIS FOR SHORT TERM ACCEPTANCE

5. The requirements of this letter do not authorize any change in the terms, conditions, delivery schedule, price, or amount of current contracts or other government contracts. In the event that NNS&DDCo considers that these requirements represent a change for which an equitable adjustment is in order, NNS&DDCo is to advise the contracting officer of the particular technical or contractual requirements regarded as changed and take no action with regard to such changed requirements until notified in writing of the contracting officer's response. However, if the contract contains the clause entitled "Notification of Changes," then NNS&DDCo shall comply with the notification provisions therein.



S. A. HEDGEPEETH
By direction

Copy to:

NNS&DDCo

NNS&DDCo

NNS&DDCo

NNS&DDCo

NNS&DDCo

NAVSEA 08E

NAVSEA 08C

NAVSEA PMS450TA

NAVSEA 05U

NAVSEA 07Q

NAVSEA 05M

NAVSEA 05Z

NRRO



DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND
1333 ISAAC HULL AVE SE
WASHINGTON NAVY YARD DC 20376-0001

9074

IN REPLY TO

Ser 450T2M/1098
11 DEC 2007

From: Program Executive Officer, Submarines
To: Northrop Grumman Corporation, Newport News Shipbuilding
(Attn: [REDACTED] Dept. 062)
Via: Supervisor of Shipbuilding, Conversion and Repair, USN
Newport News, VA (Attn: [REDACTED] Code 159)
To: Electric Boat Corporation (Attn: [REDACTED] Dept. 601)
Via: Supervisor of Shipbuilding, Conversion and Repair, USN
Groton, CT (Attn: [REDACTED] Code 156)
Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO.
N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL OF
EVALUATION OF RECENT FINDINGS ON SSN 774 AND SSN 779 AS
RELATED TO THE BASIS FOR SHORT TERM ACCEPTANCE
Ref: (a) NGNN ltr N021546 "VIRGINIA CLASS SUBMARINE PROGRAM;
CONTRACT NO. N00024-96-C-2100 - WELD FILLER METAL
CONTROL, EVALUATION OF RECENT FINDINGS ON SSN774 AND
SSN779 AS RELATED TO THE BASIS FOR APPROVAL PROVIDED
IN REFERENCE (A), FOR NAVSEA APPROVAL", dated 10
December 2007
(b) SOSNN ltr Ser SSN 774CL-260/016286, "VIRGINIA CLASS
SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100 -
WELD FILLER METAL CONTROL, EVALUATION OF RECENT
FINDINGS ON SSN774 AND SSN779 AS RELATED TO THE
BASIS FOR APPROVAL PROVIDED BY NAVAL SEA SYSTEMS
COMMAND (NAVSEA), FOR NAVSEA APPROVAL", dated 10
December 2007
(c) NGNN ltr N021499 "VIRGINIA CLASS SUBMARINE PROGRAM;
CONTRACT NO. N00024-96-C-2100 - WELD FILLER METAL
CONTROL, RECOMMENDATION FOR CONTINUED CONSTRUCTION
AND TESTING FOR SSN777, AND CONTINUED OPERATION FOR
SSN774, SSN775 AND SSN776, FOR NAVSEA APPROVAL",
dated 26 November 2007
(d) PMS450 ltr 9074 Ser 450/1058 "VIRGINIA (SSN 774)
CLASS SUBMARINE PROGRAM, CONTRACT NO. N00024-96-C-
2100; WELD FILLER METAL CONTROL, APPROVAL FOR
CONTINUED CONSTRUCTION AND TESTING FOR SSN 777 AND
FOR CONTINUED OPERATION FOR SSN 774, SSN 775 AND SSN
776" dated 29 November 2007

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO. N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL OF EVALUATION OF RECENT FINDINGS ON SSN 774 AND SSN 779 AS RELATED TO THE BASIS FOR SHORT TERM ACCEPTANCE

(e) NGNN ltr N021538 "VIRGINIA CLASS SUBMARINE PROGRAM; CONTRACT NO. N00024-96-C-2100 - WELD FILLER METAL CONTROL, RESPONSE TO SPECIFIC NAVSEA CONCERN REGARDING SSN 776 DSS-SOC CERTIFICATION, FOR NAVSEA APPROVAL", dated 4 December 2007

1. Purpose:

a. Reference (a), forwarded by reference (b), was submitted as a follow-up to reference (c) in order to provide supplemental information to support short term acceptance of VIRGINIA Class ships. Reference (d) approved continued construction and operation of SSN 777 and continued operation of SSN 774, SSN 775 and SSN 776, subject to satisfactory Liquid Penetrant (PT) inspection of the EMBT actuation system socket welds and the 2-inch CRES socket welds in the EMBT Blow system, inboard of the hull, between the Air Flasks and the HP Air Header valves. PT inspection and subsequent excavation on 2-inch NPS CRES joint EMBT-70795 on SSN 774 revealed cracking due to the presence of copper in the CRES weld. Additionally, copper contamination of 2-inch NPS CRES joint AHP-21010 on SSN 779 was identified during normal production PT inspection. Based on these additional findings, PMS450 directed NGNN to re-evaluate the rationale and assumptions provided in reference (c) and if necessary, provide additional rationale to support continued operation of SSN 774, SSN 775, SSN 776 and SSN 777 for the short term.

b. Reference (a) requests that NAVSEA concur that the inspection findings discussed in reference (a) are consistent with the technical assumptions and conditions under which approvals granted by reference (d) were provided; that SSN 777 is SAT-FOR-SEA and that SSN 774, SSN 775 and SSN 776 are satisfactory for continued, short term operation; and finally, that the SSN 776 Lock Out Trunk (LOT) is satisfactory for unrestricted operations.

2. NGNN and EB Discussion:

a. EB and NGNN completed PT inspections and material verifications on all critical joints identified in reference (d) for SSN 774 through SSN 777 (except those outstanding joints still to be completed on SSN 775 and SSN 776 identified in Enclosure (2) of reference (a)). EB and NGNN have reported satisfactory inspection results for all inspected joints (at initial inspection or following blending of initial PT

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indications); except for SSN 774 joint EMBT-70795 (as discussed above) and SSN 775 joint EMBT-20180, which exhibited PT indications and possible copper contamination. The results of the EB and NGNN evaluations conclude that the SSN 774 and SSN 775 copper contaminated welds are consistent with the assumptions described in reference (c).

b. NGNN and EB performed a comparison of PT methods and acceptance criteria to ensure an understanding of the apparent differences (if any), and to address ship to ship inspection variability. Enclosure (4) to reference (a) concludes that each shipyard uses a different, but fully qualified and satisfactory PT method.

c. NGNN reviewed the reference (c) technical rationale to determine if the SSN 774 and SSN 779 instances of copper contamination invalidated any of the underlying assumptions. Based on comparison of the macrographs of SSN 774 joint EMBT-70795 to the NGNN CRES Fatigue Test Joint, NGNN and EB concluded that the bounding assumptions in reference (c) encompass the conditions observed in SSN 774 joint EMBT-70795. EB and NGNN conclude that this joint would be expected to exhibit ductile behavior consistent with a leak before break condition. In addition, laboratory analysis of SSN 779 joint AHP-21010 confirms that a limited amount of copper was deposited in the CRES weld, and since the contamination was limited in depth and circumference, it is appropriate to conclude that a leak before break condition would have been retained. NGNN and EB conclude that the additional instances of copper contamination in the SSN 774 and SSN 779 weld joints do not invalidate the basis for short term acceptance discussed in reference (c) and approved by reference (d).

3. SUPSHIPNN Discussion:

a. SUPSHIPNN has reviewed reference (a) and provides the following comments and recommendations:

1) SUPSHIPNN concurs that the additional instances of copper contamination identified on SSN 774 and SSN 779 do not invalidate the basis for short term acceptance recommended in reference (c) and approved by reference (d).

2) SUPSHIPNN recommends that SSN 777 be approved for continued construction and testing until life of ship

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acceptability has been determined and further, that SSN 774 be approved for continued operation until life of ship acceptability has been determined.

3) SUPSHIPNN concurs with the report and conclusions contained in the comparison of the PT materials and techniques as documented in Enclosure (4) to reference (a).

4) SUPSHIPNN concurs that, pending satisfactory completion of the outstanding SSN 775 and SSN 776 joint inspections, each respective submarine is acceptable for continued operation until life of ship acceptability has been determined.

5) SUPSHIPNN does not concur that SSN 776 LOT is acceptable for unrestricted service, as acceptance of the SSN 776 LOT will be the subject of separate correspondence.

b. SUPSHIPNN recommends NAVSEA approval of reference (a) as modified in 3.a above.

4. PMS450 Discussion:

a. Based on the supplemental information submitted by NGNN and EB in reference (a), PMS450 concurs with the reference (a) conclusions that the additional findings of incorrect filler metal in the 2-inch, socket welds on SSN 774 and SSN 779 (and possibly on SSN 775) are consistent with the findings and conclusions detailed in reference (c) to show that joints can be expected to reliably exhibit leak-before-break behavior and will not impact short term safe operation of VIRGINIA Class submarines.

b. PMS450 concurs that SSN 774 and SSN 777 are still acceptable for continued operation based on the rationale documented in reference (d) and the results of the inspections performed on the critical EMBT system socket welded joints on each respective ship as reported in reference (a). PMS450 concurs with the SUPSHIPNN recommendation that short term approval for SSN 775 and SSN 776 for continued operation shall be subject to completion of the remaining joint inspections on the respective hulls.

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5. PMS450 Action: PMS450 approves continued construction and testing for SSN 777, continued operation of SSN 774 and, subject to completion of the remaining joint inspections on SSN 775 and SSN 776, continued operation of the respective hulls, until life-of-ship acceptability has been determined. Approval of the SSN 776 LOT, as requested in reference (e), will be addressed by separate correspondence.

6. Request for NGNN Action: As stated in reference (d), NGNN shall submit their final, life-of-ship recommendation for the VIRGINIA Class to NAVSEA, with Design Agent concurrence, for approval by 15 April 2008. NGNN shall ensure a liability for SSN 777 exists and is coded for Delivery. At that time, NGNN shall issue a Departure from Specification (DFS) for SSN 777 pending completion of the life-of-ship evaluation.

7. Request for EB Action: EB shall issue a DFS for each remaining hull (SSN 774, SSN 775 and SSN 776) to document the subject liability until completion of the life-of-ship evaluation.

8. Request for SUPSHIP Action: SUPSHIP shall locally approve the subject liabilities and DFSs discussed in paragraphs 6 and 7 above.

9. Point of Contact: The PMS450 point of contact for this correspondence is [REDACTED] at [REDACTED]

10. The requirements of this letter do not authorize any changes in the terms, conditions, delivery schedule, price or amount of the subject contract or any other Government contract. In the event that you consider that these requirements represent a change for which you are entitled to an equitable adjustment, you are to comply with the requirements of the Notification of Changes clause on the contract.

[REDACTED]
By direction

Subj: VIRGINIA (SSN 774) CLASS SUBMARINE PROGRAM, CONTRACT NO.
N00024-96-C-2100; WELD FILLER METAL CONTROL, APPROVAL OF
EVALUATION OF RECENT FINDINGS ON SSN 774 AND SSN 779 AS
RELATED TO THE BASIS FOR SHORT TERM ACCEPTANCE

Copy to:

NGNN [REDACTED] Dept. 011; [REDACTED] Dept. 062)

EB [REDACTED] Dept 601; [REDACTED] Dept. 601; [REDACTED]
Dept. 686; [REDACTED] Dept. 601)

SUPSHIP Newport News [REDACTED] Code 260; [REDACTED] Code 250;
[REDACTED] Code 350; [REDACTED] Code 200; [REDACTED]
Code 101)

SUPSHIP Groton [REDACTED] Code 250M, [REDACTED] Code 200)